Educational Writings

I. RECENT LITERATURE FOR THE TEACHER OF SECONDARY-SCHOOL MATHEMATICS

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This paper attempts to select from the mass of educational literature, published between September, 1917, and June, 1918, a minimum of professional reading for the teacher of secondary-school mathematics. A similar list covering the period of the school year 1916-1917 was published in the *School Review*, September, 1917.

The principal topics of interest during the past year seem to have been the following:

1. A consideration of the educational values of high-school mathematics, especially the disciplinary value of mathematics.

The great interest in this topic among teachers of mathematics is largely due to the attacks on mathematics on the part of several prominent educators who insist that mathematics be eliminated from the curriculum as a required subject. This has led to the appointment and subsequent reports of several committees, and to a series of articles defending one or the other side of the question.

These articles and reports furnish considerable interesting and valuable material. However, one immediate result of this discussion is the growing conviction among teachers that in the future important educational questions must be decided by scientific measurement rather than through opinions advanced by a number of individuals, however successful they may have been in their professions or in business.

2. Scientific measurement of the values and methods of mathematics.

Comparatively little experimental work has been done along this line. It is therefore easy for a teacher to make himself familiar with this new and promising movement.

3. Junior High School Mathematics.

In order to understand the aims and character of junior high school mathematics, the teacher must study the general aims of this new movement. A transfer of the methods and content of high-school mathematics down into the seventh and eighth grades will not be sufficient. There must be a complete reconstruction of the traditional course.

4. Supervised study in mathematics.

Teachers who are interested in this important movement should first study the general aspects of the introduction and administration of supervised study in the whole school, particularly those phases of the supervised study movement which are common to all departments. The articles reviewed below show that the technique of supervised study for mathematics, is being worked out successfully in various schools.

5. Improvement of Methods and Content.

6. Mathematical requirements and examinations.

7. Textbooks on high-school mathematics.

THE VALUES OF HIGH-SCHOOL MATHEMATICS

1. *Remarks on Psychological Investigations Bearing on the Disciplinary Value of Studies.* By J. W. A. YOUNG, School Science and Mathematics, February, 1918.

The writer expresses his views on various psychological experiments. He reaches the conclusions that these researches are valuable but by no means conclusive.

2. *The Doctrine of Formal Discipline.* By NATHAN A. HARVEY. School Science and Mathematics, June, 1918.

The principal part of this paper is a selection of numerous extracts taken from a number of books, and supporting the doctrine of formal discipline.

3. *Significant Movements in Secondary School Mathematics.* By RALEIGH SCHORLING. Teacher's College Record, November, 1917.

The writer begins with a summary of the recent criticisms of secondary mathematics. After a discussion of the disciplinary and practical values of mathematics he describes such movements as he hopes will overcome the discontent with the results of mathematics teaching. They are essentially

the following: the growing tendency to psychologize mathematics, the formation of composite courses, the junior high school movement, and the appearance of standard tests.

4. *Valid Aims and Purposes for the Study of Mathematics in Secondary Schools.* A series of articles appearing in School Science and Mathematics, January, February, March, and April, 1918. By ALFRED DAVIS

An elaborate discussion of the values, aims and purposes of secondary mathematics. An interesting feature is the report of the opinions of fifty-five successful men on the value they received from the study of mathematics.

5. *Mathematics in Secondary Schools.* By DAVID SNEDDEN. School and Society, December 1, 1917.

Mr. Snedden gives his views on the preceding report of Mr. Davis on the "Status of Mathematics in Secondary Schools." He takes this opportunity to point out that there is a distinction between "making algebra obligatory" and the "abandonment of the subject." He suggests sarcastically that an exhaustive report on the opinion regarding mathematics, of those who become failures whould furnish further interesting reading.

6. *Education for Those Who Become Failures.* By G. A. MILLER, School and Society, December 15, 1917.

This is a reply to Mr. Snedden's suggestions and criticisms, as outlined in the preceding article.

7. *Remarks on Certain Attacks That Have Been Made Upon the Teaching of Mathematics, with Counter Criticisms.* By HARRIS HANCOCK. School Society, September 22, 1917.

In the first part the writer replies particularly to some of Dr. Flexner's statements made in his well known article "A Modern School" and concludes that it is time to protest when vagaries are being transmitted through teachers' colleges by the wholesale. He admits that "American children fail to gain either knowledge or power, and spend an inordinately long time in failing" but thinks that the traditional curriculum is not responsible for this situation. Rather than to spend their time in "irrevalent professional pedagogical studies" offered in such schools, it is his opinion that student teachers should be required to make themselves proficient in English, history, arithmetic, and geography, if a remedy is to be found for the defective education of our public schools.

8. *Does the Study of Mathematics Train the Mind Specifically or Universally?* By ERNEST C. MOORE, School and Society, October 27, 1917.

The writer asserts that the value of mathematics as a universal discipline is not proven, it is disputed; that historically no such claim is made for the study. The question we try to answer in life is, of what principle is this case an instance, or under what principle does this particular thing belong, while in mathematics the question is what conclusions follow from given premises. A portion of this paper is devoted to a discussion of experimental studies, particularly Dr. Rugg's experiment on the transfer of training and his conclusions.

The subject of formal discipline is discussed further by the same writer in the following article:

9. *Mathematics and Formal Discipline.* School and Society, February 2, 1918.

In the following two papers Professor E. C. Moore's views are attacked:

10. *The Disciplinary Values of the Study of Mathematics.* By CHARLES N. MOORE, School and Society, March 9, 1918.

11. *Does the Study of Mathematics Train the Mind Specifically or Universally?* By ROBT. E. MORITZ, School and Society, April 27, 1918.

SCIENTIFIC MEASUREMENT OF THE VALUES AND METHODS OF MATHEMATICS

1. *The Measurement of High School Mathematics.* By S. A. COURTIS. School Science and Mathematics, June, 1918.

A criticism of high-school mathematics and a discussion of the formal discipline theory as one of the values of mathematics. The writer appeals to teachers of mathematics to study the problem of measuring the values of mathematics and gives several definite suggestions as to the way of beginning investigations along this line.

2. *Concerning Experiments to Test the Transfer of Training.* By J. W. A. YOUNG, School Science and Mathematics, January, 1918.

This is a very complete summary of the experimental work on formal discipline that has been done to date.

3. *Experimental Tests of Mathematical Ability and Their Prognostic Value.* By AGNES L. ROGERS, Columbia University Contributions to Education No. 89.

This first chapter of this monograph is a statement of the purpose. Chapter II contains exercises for tests. Chapter III is an analysis of mathematical ability, and the fourth chapter gives a summary of the conclusions.

4. *Scientific Method in the Reconstruction of Ninth-Grade Mathematics.* By HAROLD ARDWAY RUGG, and JOHN ROSCOE CLARK. Supplementary Educational Monographs, Vol. II, No. 1. The University of Chicago Press, pp. vi+189.

Convinced that the traditional ninth-grade course in mathematics does not accomplish the aims and values claimed for that subject, the authors have undertaken to evaluate the effectiveness of the course. A detailed inventory of the present ninth-grade mathematics is made, showing that formal work greatly exceeds "thought" problems. There is a discussion of standardized tests and a careful examination of the results of these tests. A description of typical errors of the pupil will interest the reader. The authors advocate the use of "practice exercises" to help the pupil to gain the skill necessary to overcome these errors. Of especial value are the chapters containing an analysis of the subject matter from the standpoint of learning and the description of an experimental study of the process of learning algebra.

5. *An Investigation of Certain Abilities Fundamental to the Study of Geometry.* A Thesis Required for the Degree of Doctor of Philosophy, The University of Pennsylvania. By JOHN HARRISON MINNICK.

The demonstration of a theorem involves the abilities to draw a figure, to state the hypothesis and conclusion, to recall the facts which follow from given facts and to select and arrange the facts needed to arrive at the conclusion.

These abilities are tested by means of tests which are detail. This is followed by a discussion of the method of giving and examining the tests, and the author's conclusions.

JUNIOR HIGH-SCHOOL MATHEMATICS

1. *Conditions Which Have Led to the Establishment of the Junior High School.* By HARRISON E. WEBB, The Mathematics Teacher, December, 1917.

The paper suggests that generalized mathematics may supply the needs of the Junior high school. This is to include the principles of arithmetic, symbolic form of expression, informal geometry, elementary equations and problems, and a wide field of applications.

2. *The Junior High School. Its Place in the Reorganization of Education.* By ARTHUR J. JONES. School Review, February, 1918.

The junior high school is regarded as a plan of meeting the needs of the individual pupil of a certain age. Its essential features are discussed and the attempt is made to clear up current misunderstanding regarding the aims of the movement.

3. *A Tentative Program of Junior High-School Mathematics.* By C. B. WALSH. The Mathematics Teacher, December, 1917.

This is a report of an experiment with junior high-school mathematics. Briefly summarized the plan is to offer arithmetic and intuitive geometry in the seventh year, algebra in the eighth, and demonstrative geometry in the ninth year.

4. *The Teaching of Mathematics in the Junior High School* By WILLIAM BETZ. The Mathematics Teacher, December, 1917.

The writer studies the problem of working out a program for the mathematics of the Junior high school. The aims and purposes suggest the choice of subject matter and methods. He recognizes the various administrative aspects of the question and the social elements involved.

SUPERVISED STUDY

1. *Supervised Study in the High School.* By G. W. WILLETT. School Review, April, 1918.

In this article we have a summary of reasons given by various educators for the need of supervised study. Several plans are described in detail. The writer emphasizes the need of developing a technique peculiar to each subject. He feels that without a sympathetic attitude of the teachers supervised study cannot be successful.

His list of the opinions of 532 pupils is interesting and suggestive. It was found that out of 532 pupils 500 favored the study period, while the remaining 32 were against it.

This article contains a brief bibliography on the subject.

2. *How to Introduce Supervised Study* By ALFRED HALL-QUEST. School Review, May, 1918.

Frequently reports are heard of the failure of supervised study. This failure is due largely to many difficulties arising in connection with the introduction of supervised study. To help the teacher to avoid certain mistakes the writer suggests various safeguards against failure.

3. *Supervised Study in the Junior High School.* By H. C. HINES, School and Society, November 3, 1917.

A review is given of the various plans of supervised study. The writer states several reasons for being in favor of the divided study period, one part being used for study and the other for recitation.

4. *Technique of Supervised Study.* By EUGENE D. MERRIMAN. School Review, January, 1918.

A technique is formulated for supervising and directing the pupils at study.

5. *Supervised Study in the University of Chicago High School.* By G. L. HARRIS. School Review, September, 1918.

This is probably the most detailed description of the technique of supervised study that has been published to date. The article reveals many interesting facts about the way high-school pupils study. Mr. Harris also has worked out a plan of avoiding conflicts for the pupil who must attend study classes in several departments.

Some statistics showing the benefit derived from these study classes emphasize the need and desirability of having such classes.

IMPROVEMENT OF METHODS AND CONTENT

1. *The Place of Memory in the Teaching of Mathematics.* By R. NETTELL The School World, October, 1917.

Many teachers tacitly assume that when mathematics is understood it can always be reproduced when needed. To neglect the full use of memory is a loss to mathematical training. Not only should pupils grasp the meaning of mathematical ideas, but they should also be capable of recalling them. Some portions of mathematics should be committed to memory.

2. *Geometry in the Elementary School.* By S. E. SLOCUM. Educational Review, October, 1917.

In planning a complete course in plane geometry the writer says that three stages must be recognized in the unfolding of the geometric concepts.

The primary stage whose purpose is to familiarize the child with simple geometric ideas by means of object teaching, paper folding, and similar methods.

The second stage which is to stimulate imagination and informal reasoning.

The third stage of formal demonstration of abstract relations. This is the high-school age. The subject matter should be divided into two groups, statements to be accepted by pupils without proof, and statements that are not obvious.

If more concrete geometry could be given in the grades, the teaching of geometry in the high school would be simplified and room would be made for the inclusion of topics of modern geometry.

3. *First-Year Mathematics for High Schools.* By C. B. WALSH. School Science and Mathematics, December, 1917.

For this first course the writer recommends a limited amount of demonstrational geometry, introduced very gradually. The course should include many practical applications. Algebra and trigonometry are to be introduced when needed.

4. *Progressive Teaching of Mathematics.* By G. W. MYERS. School Science and Mathematics, May, 1918.

The author discusses the right attitude and the proper views of the progressive teacher. Attention is called to some of the principal values of a mathematical education, and an appeal is made to teachers to help set up more adequate standards.

MATHEMATICAL REQUIREMENTS AND EXAMINATIONS

1. *Foreign Languages and Mathematical Requirement for Admission to and Graduation from American Colleges and Universities.* By E. E. LEWIS. School Review, January, 1918.

The article is a report of a study of the entrance and graduation requirements in mathematics in thirty-five leading American institutions. The results lead to the conclusion that there is a tendency toward elimination of specific requirements in mathematics.

2. *Comprehensive Examinations.* By ELIZABETH B. COWLEY. The Mathematics Teacher, September, 1917.

This is a discussion of the advantages and disadvantages of the comprehensive college entrance examinations.

3. *How Can We Minimize the Effects of Examinations on Secondary Education?* By JAMES H. SHIPLEY. The Mathematics Teacher, March, 1918.

In the opinion of the writer such examinations as the regent's examinations in New York are injurious. They cause the teaching to degenerate into memorizing and cramming.

The waste of time entailed in giving them and preparing for them is enormous.   They are unfair and injurious to the pupil's health.   Comparatively very little value is derived from them.

An outline is given of a substitute plan to take the place of these examinations.

TEXTBOOKS

1. *Junior High-School Mathematics, First Course.*   By WILLIAM L. VOSBURGH and FREDERICK W. GENTLEMAN.   New York: The Macmillan Company. Pp. vii and 146.   Price 75cents.

This book presents a review of the essentials of elementary arithmetic, simple equations and ratios, measurement of angles, areas of simple plane figures, percentage, and interest.   The graph is used to illustrate data.   An attempt is made to select such problems as are of interest to the pupil of Junior high-school age.

2. *Junior High-School Mathematics, Second Course.*   By WILLIAM L. VOSBURGH and FREDERICK W. GENTLEMAN.   New York: The Macmillan Company.   Pp. x and 212.

A continuation of the work begun in the first course.   Its main divisions are percentage and problems relating to the home and to farm and city life; a study of simple plane figures, measuration of plane figures and solids, linear equations in one and two unknowns.

3. *Commercial Algebra, Books I and II.*   By GEORGE WENTWORTH, DAVID EUGENE SMITH, and WILLIAM S. SCHLAUCH, Pp. v and 266, and v and 250. Boston: Ginn and Company.

These books are prepared to meet the needs of commercial high schools. The principal features are the wide use of the formula, the elimination of non-essential work usually offered in courses in algebra and the many problems derived from cases actually arising in business.   The work in algebra includes the following topics: simple integral and fractional equations, fractions, powers and roots, series, and logarithms.

4. *A First Course in Algebra.*   By HERBERT E. HAWKES, WILLIAM A. LUBY, and FRANK C. TOUTON.   Boston: Ginn and Company, Pp. ix and 301.

This is a revision of a former edition.   Improvements are made along the following lines.   Numerous oral exercises precede new ideas and operations.   Many new lists of problems and exercises are introduced.

The revision is a better book than the earlier edition.

5. *Plane Geometry.* By H. E. SLAUGHT and N. J. LENNES. Pp. vii and 310. Boston: Allyn and Bacon.

The most prominent feature of this book is the large number of practical applications. A simple treatment greatly improves the chapters of areas and regular polygons. The number of theorems has been reduced.

6. *A Second Course in Algebra.* By HERBERT E. HAWKES, WILLIAM A. LUBY and FRANK C. TOUTON. Boston: Ginn and Company. Pp. vii and 277.

This is a revision of an older book. It differs from the former edition in the omission of some non-essential topics and in simplicity of treatment of such topics as irrational equations, simultaneous quadratics, logarithms and the binomical theorem.

7. *Third-Year Mathematics for Secondary Schools.* By E. R. BRESLICH. The University of Chicago Press. Pp. xviii and 476 with tables, and pp. xviii and 369 without tables.

This is the third book of a series of textbooks in correlated mathematics. It completes the elementary algebra, trigonometry and solid geometry of the earlier books.

The book may also be used as a review text in senior high-school classes, as it contains many college entrance examination questions and a summary of the theorems of geometry.

8. *Logarithmic and Trigonometric Tables.* By E. R. BRESLICH. The University of Chicago Press. Pp. xvii and 118.

The book contains an explanation of the use of the tables. Besides the tables on common logarithms, the logarithms of the trigonometric functions and the natural trigonometric functions there are brief tables of powers and roots, mathematical formulas, equivalents and reductions.

Although originally designed for use with "Third-Year Mathematics" the book will be valuable in any course in trigonometry or surveying, and in engineering courses.

9. *Exercises for Methods of Teaching in High Schools.* By SAMUEL CHESTER PARKER. Boston: Ginn and Company. Pp. x and 261.

This book is intended to provide material to give the student practice in interpreting the discussions in Professor Parker's well-known book "Methods of Teaching in High School." The teacher of mathematics will find in this book many suggestions relating to his work. For example, the pupils' mathematical equipment, features of a good textbook, how to vitalize geometry, drill in mathematics, originals, graphing, etc.